ALLEN BRADLEY

OPERATOR MANUAL

7/16/97

Click here to
EXIT Manual

Attention symbols

Some of the warnings, instructions and advice in this manual are so important that we used the following special symbols to draw attention to them:

Warnings

This symbol indicates a warning. Injury or even death may result if you do not heed it.
This symbol is also used to mark out safety components etc. See section ”Safety devices, a survey” in chapter ”Introduction” in the OPERATOR MANUAL or chapter ”Maintenance” in the SERVICE MANUAL.

Instructions

This symbol indicates instructions which are important, for example to prevent damage to the sterilizer and/or the load.

Advice

This symbol indicates important advice and hints that make it easier to work with the sterilizer.

GETINGE Castle

OPERATOR MANUAL
TABLE OF CONTENTS

Attention symbols

1. INTRODUCTION

Introduction GE 1
Safety devices, a survey 2

2. THE PROCESS

Steam/vacuum-process 1
Chamber leak test 2

3. INSTRUMENTS AND CONTROLS

4. OPERATION

Start-up 1
General advice when using the sterilizer 2
Monitoring the load temperature when sterilizing liquids 2

5. INSTALLATION

Unpacking 1
Storage 1
Installation 1
Connection 2
Electricity 3
Water 4
Steam 5
Compressed air 9
Exhaust from safety valve 10
Drain 11
Ventilation 11
Functional test prior to use 11

6. OPERATING INSTRUCTION

Preoperation checks 2
Sterilizing 2

Close down 3
Blowing safety valve 3
Program Combinations 4

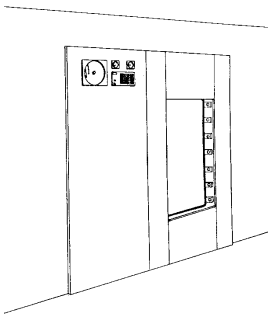
7. CONTROL UNIT ALLEN BRADLEY

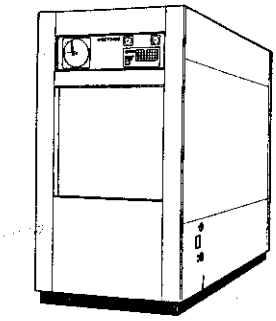
Operating panel SLC 504 2
Push Buttons/Indicator Lights - Load Side 4
Push Buttons/Indicator Lights - Unload Side 5
Passwords 6
Detailed screen displays 7
Alarm and System Messages - Troubleshooting 26
System Interlocks - Horizontal Doors 36
Technical data 37

1. INTRODUCTION

Introduction GE

Sterilizer type GE is the collective designation of a range of GETINGE high pressure sterilizers using steam and vacuum in the process for sterilization. GE-sterilizers are available with vertically or horizontally sliding doors. Both single and double ended types exist.





The GE-sterilizers are intended for sterilization of materials in the health service as well as in the pharmaceutical industry. The type of materials include: instruments, utensils, glass, plastic, leather and textiles. Some sterilizers have special programs for sterilization of hot and cold liquids. The dominant sterilizing agent is steam at a temperature of 120-135 °C.

Adaptation to respective sterilization requirements is made primarily by selecting the type of software for the control unit. The sterilizer control unit is computerized and provides for a large variety of processes with very good accuracy in control of the process parameters. Both real time and set values for a process may be displayed on request.

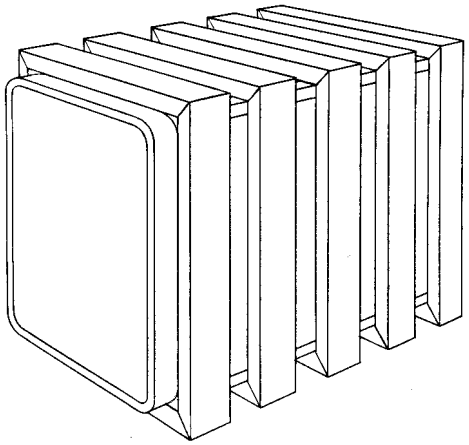
The software which controls the processes can be preprogrammed with cycle parameters to provide speed and safety in the production line. When it comes to unique cycles, many process parameters can be modified from time to time by the operator.

Reprogramming of the control unit can be made on site.

The automatic doors are provided with safety devices to protect the operator.

The sterilizer chamber, made of acid proof stainless steel, is covered externally by seal-welded u-channel. About half of the chamber area is covered by these u-channels. They serve both as stiffening bars for the

pressure vessel and as a steam jacket providing temperature controlled steam heating for the chamber walls.



The GE-type sterilizers should be supplied with electricity, cold water, compressed air and steam. If central steam is not available or there are reasons not to use it, GE-units can be equipped with an electric steam generator.

Safety devices, a survey

The panels of the sterilizer shall prevent the operator access to the inner parts of the sterilizer. Only specially trained personnel have access to the inner parts.

Safety components

Every sterilizer is equipped with a number of components the purpose of which is to specifically guarantee human safety. These items are marked with the sign below:

- **Electric diagrams**
- **Piping diagrams**

These components have been subject to special tests before being accepted as safety components and must therefore not be substituted by any make or execution not approved by Getinge/Castle, Inc.
It is of greatest importance that these components are kept in good working condition in order to maintain a safe function during the sterilizer life time.

The sign is used not only to point out important components, but also to emphasize such other safety factors requiring special attention as measurements, tolerances, material etc.

Doors

The doors are kept closed by the automatic control unit while cycles are in progress and also when supply media fail. The doors do not open until the condition *chamber pressure = atmopheric pressure* is fulfilled, not even in case of an electric failure causing an opening command. The vertically sliding door is actuated by a compressed air cylinder with a choked air inlet. A much larger outlet is arranged directly at the cylinder end. Objects stopping the upward motion of the door will exert pressure on a plate running the entire length of the top of the door. The plate acts directly upon the outlet valve which opens thereby interrupting the door motion. This will prevent operator injuries and material damage. A brace stops the door from opening in case the pneumatic cylinder should unintentionally become depressurized. The brace can not be removed in case the compressed air pressure is to low to keep the door in the upper position.

Emergency stop

In the front panel, at the side of the door, there is a push button mounted having dual functions:

A **While actuating the door:**
To stop the door motion immediately.
A push on the button releases an alarm resulting in the door stopping its motion.

B **While the door is closed:**
During a cycle, the process is aborted and all valves for media to the chamber close. This releases an alarm.

Trim plates

Panels may be removed by means of tools or keys. The panels form a barrier for operators, but not for specially trained technicians. Stainless steel surfaces within reach of the operating personnel are insulated and cooled to a safe temperature.

Valves

As standard, electric and pneumatically actuated valves are normally closed (forced closed by means of a spring force when not actuated). This prevents undesired flow through the valves in case of power failure. A fail safe function is achieved.

Pressure vessel

The sterilizer chamber and jacket are pressure vessels, built in accordance with regulations stipulated by ASME.

The pressure vessels are protected against excess pressure by use of safety valves.

The pressure vessels and safety valves comply with Section VIII of ASME pressure vessel code.

Monitoring the pressure behind the door seal

All valves admitting medium to the chamber are kept closed until the pressure behind the door seal is high enough to guarantee the tightness of the chamber.

Monitoring the load temperature when sterilizing liquids

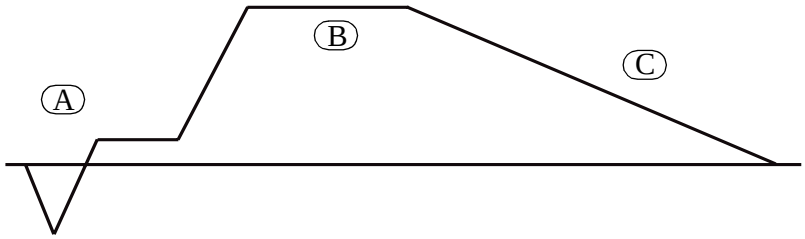
When running a liquid cycle, the doors are kept closed until the temperature of the liquid has fallen below its boiling point.

2. THE PROCESS

Steam/vacuum-process

As the sterilizer is equipped with a vacuum pump it can serve as an ordinary steam sterilizer, suitable for sterilization of utensils, containers, textiles etc.

The universal steam/vacuum process can be divided into pretreatment (A), sterilizing (B) and post-treatment (C).



Pretreatment

It has been generally accepted that moisture is an essential element in achieving sterility with steam. Therefore it is important that the steam comes in close contact with the microorganisms to be killed. Any air present serves as an insulation which prevents the contact and lowers the temperature.

A pretreatment phase, consisting of a number of pressure variations following a certain pattern, effectively removes air from various types of goods and produces the moisture required in the subsequent sterilizing phase.

Air removal when autoclaving aqueous solutions in open containers is made by a single prevacuum or by steam-air displacement. This prevents the liquid from boiling during the decompression periods that occurs in a pulsating procedure.

Sterilizing

The sterilization timer starts from the moment when the chamber temperature transducer signals a temperature equal to or higher than the chamber temperature set point. Count down of the sterilizing time stops at temperatures below this sterilizing temperature.

When sterilizing goods, in particular liquids, where the sterilizing temperature is measured within the goods, load sensors are used. The

condition for starting the sterilization timer is when the chamber sensor and all load sensors indicate a temperature equal to or above nominal sterilizing temperature

Post treatment

The post treatment is intended to normalize the temperature and moisture content of the goods. All types of goods, except liquids, are exposed to a deep vacuum for a certain period of time.

The post treatment of aqueous solutions sterilized in open or vented containers consists of a period of natural cooling. The pressure and temperature are lowered slowly until the temperature of the liquid is safely below its boiling point. This process is speeded up by applying a slight vacuum to the chamber when its pressure approaches atmospheric.

The sterilizer door will remain sealed by its gasket until atmospheric pressure prevails in the chamber.

Chamber leak test

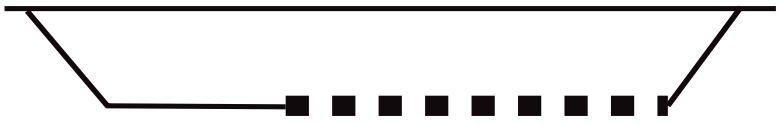
The autoclave is equipped with a program for automatic leak test of the autoclave chamber. A leak test shall be performed with empty chamber.

The leak test process has its own program number (See list of programs).

The vacuum pump evacuates the chamber. The pump stops when a deep vacuum is reached. For a short period of time after this evacuation a slight rise of the chamber pressure takes place which is not due to leakage but results from evaporation of condensate and temperature pressure changes of the recently evacuated residual steam.

A chamber pressure rise caused by air leakage can not be detected until the conditions in the chamber are stable. Not earlier than 5 minutes after the vacuum pump has stopped should the pressure and time be measured.

A satisfactory leak test allows for a maximum permissible pressure raise of 0.5 psig in 1 hour. A failed leak test will result in an alarm.



Test period

Air filter sterilization and test

The sterilizer is equipped with a program for automatic air-filter sterilization.

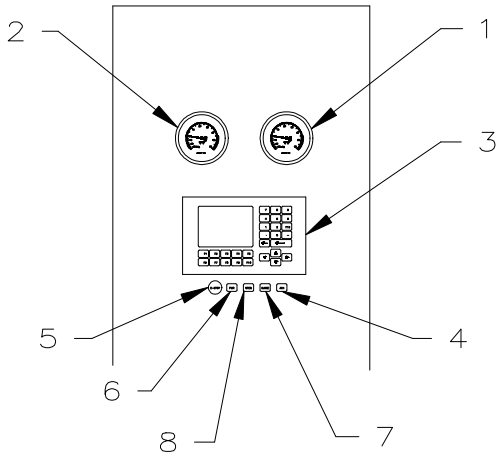
The filter sterilization has its own program number (See list of programs).

The filter is sterilized by passing steam through the filter and the filter housing. A temperature sensor in the piping controls the temperature.

After sterilization the system is cooled by a restricted airflow through the filter.

3. INSTRUMENTS AND CONTROLS

Load Side



1.	Jacket pressure gauge	5	Emergency stop
2	Chamber pressure gauge	6	Alarm Acknowledge
3	Operator Panel	7	Open Door
4	Control voltage switch	8	Close Door

Operator panel

Get acquainted with the function of the buttons and signal lights on the operator panel by studying the in Chapter 7 in the Operator Manual.

Emergency stop

See *Safety devices, a survey*, Chapter 1 in the Operator Manuanl.

4. OPERATION

Start-up

Before start-up the operator selects a suitable program. Where appropriate the operator specifies process parameters and other information requested by the control system.

The process is then started by pressing the start button.

Process start-up is prevented if:

- there is an unacknowledged alarm.
- the door is not closed and interlocked in accordance with the conditions imposed.
- the self-checking of the control system has detected a fault at the door limit switch.
- the keyswitch for manual stepping is activated.
- media supply (i.e. steam or water) is not available (only if the sterilizer is equipped with pressure switches for this).
- the jacket temperature has not been reached (only if the process includes jacket heating).

Idling sterilizer

An alarm situation for an idling sterilizer stops it from being started.

- Call for a technician.

Repeated alarms

In case repeated alarms make it impossible to end the cycle, let an authorized technician end the cycle manually.

When several faults occur, only the last will be displayed.

Blowing safety valve

In case the safety valve on the chamber or jacket blows:

- Press the EMERGENCY STOP button.
- If ineffective, cut the power with the wall-mounted disconnect.
- Call for a technician.

General advice when using the sterilizer

- Keep the sterilizer door closed when not sterilizing.
- Be alert to everything that appears unusual such as leaks, humming solenoid valves, jamming mechanical devices etc. Remedy the situation before it becomes a malfunction

When loading:

- Place all load sensors in the load. Be careful not to cut or run over the sensor cables when loading and unloading, as well as when closing the doors.

When running Steam/vacuum process:

- Arrange bowl shaped articles with the hollow part downwards.
- Empty containers (bottles, flasks, test glasses etc.) should be placed with their openings facing downwards.
- Heavy goods should be placed near bottom of the chamber.

Monitoring the load temperature when sterilizing liquids

If the door on a sterilizer, containing a load of liquids, is opened before the liquid temperature has fallen below a certain temperature, closed bottles may explode while open containers may boil over.
The course may develop violently with great danger to human life and technical equipment.

Safety arrangements

One or several temperature sensors in the load are sensing the temperature in the liquid. These sensors keep the sterilizer doors closed until the temperature is safely below the boiling point. An alarm will be emitted in case of a break or short circuit in the sensor.

Weekly cleaning (to be made by the daily operator)

The sterilizer should have cooled down before cleaning.

To reduce the risks for injuries, shut the power of.

1. Clean the chamber drain strainer.
2. a) Remove shelf guides and loose plates.
   b) Clean the chamber internally.
   c) A non chloric cleaner should be used. If particularly stubborn, scouring powder or chrome cleaner could be used occasionally.
   Steel wool must never be used!
   Sterilizers frequently used for sterilization of chloric solutions demand thorough cleaning as residuals may cause serious corrosion even in stainless materials. An acetified cleaner is best suited for this purpose. Thorough rinsing is essential.
3. Clean the sterilizer external stainless steel surfaces with a normal household cleaner that does not contain abrasive. Take care when cleaning lacquered surfaces, texts and plastic articles.

5. INSTALLATION

Find out the central point of gravity when lifting and transporting a packed or not packed sterilizer thereby avoiding serious accidents.

Unpacking

- Check when unpacking the apparatus that the NB No. of its data plate conforms with the NB No. of the documents.
- Check that the sterilizer is undamaged. Any transportation damage should be reported within seven days to the transport company that was responsible for delivery.
- Do not remove the protective plastic film from stainless steel panels until the installation is completed.
- There is certain equipment, such as expendable items; control unit; etc. packed inside the sterilizer chamber.

Please note that these articles are specific for each sterilizer. When unpacking more than one sterilizer the articles are not to be interchanged.

Storage

The sterilizer should be stored in a temperature between 36°F and 104 °F and at a maximum relative humidity 95% (not condensating).

Installation

- Place the sterilizer close to but never over a drain. Leave a well sized clearance space on both sides for good operation and easy and safe maintenance of the equipment. The back of the sterilizer may if necessary come up close to a wall. See also appropriate diagrams and drawings.

- Arrange for escape distances, as directed from labor safety point of view, to be contained.
- Place stainless steel floor pads under each levelling leg to protect the floor. Adjust the legs to make the loading height fall within specified dimension, while checking by means of a spirit level that the sterilizer chamber bottom is horizontal.

Connection

Certain installation operations should be carried out by authorized technicians. This is especially the case when it comes to electricity, steam water and air.
Faulty accomplished installation may jeopardize the safety to person and property and invalidates manufacturer's warranty on the equipment.

Piping and electrical wiring should be made in a neat manner to make the service compartment look workman like.

- Find out the connection points and connection data of the sterilizer by studying the installation drawings.
- Pay attention to local, state and national regulations.
- Remove impurities by blowing through all pipes to be connected to the sterilizer.
- Insulate hot pipes, where necessary, to avoid injury.
- Mark pipes and electrical leads.

Install shut-off valves in the supply lines in an easily accessible location near the equipment so as to avoid risk areas when using these. Due to the risk of injury an un-accessible area of the service compartment is not a suitable place.

Electricity

Before welding on or near-by the sterilizer, the boards of the control system have to be isolated!
Disconnect all plug-in connectors from all PCB's!

The electric components of the control unit will tolerate supply line voltage variations of ±10%. Greater fluctuations demand that a voltage stabilizer be introduced between the sterilizer automatic fuse and the control equipment. The latter will cause an inductive load on the stabilizer this should be well oversized (minimum.5 kW). The frequency deviation may amount to ±1%.

- Check that all electric wire connection screws are tightened.

Connect the sterilizer to an electric 60 Hz; 3 Ph/ 208 - 480 volts (depending upon pump size) + ground, through a closely situated disconnect.

The stated voltage is for various versions of the sterilizer. Check on the equipment arrangement drawing and the utility data sheet for the required electrical connections. Those documents also give information about power and fuse ratings that may be important for choosing the correct size of cables.

Units equipped with vacuum pumps

Check by manual operation of the direct on line starter of the vacuum pump, that the direction of rotation conforms with the arrow on the pump housing.

Running the shaft seal dry will destroy it in a few seconds.

Change any two of the main supply wires on their connection terminal to reverse the direction of rotation.

Water

Cooling water for heat exchanger

The sterilizer has a pressure gauge connected to the cooling water supply pipe. It is normally situated in the service area. The cooling water must not be corrosive, nor must it contain abrasives or scaling particles. The water salt content should not cause scaling as a result of the temperature. If the cooling water is to be recirculated, the pressure in the return pipe should be at least 250 kPa (36 psig) lower than in the supply pipe.

- Connect the sterilizer via a shut off valve to a cooling water supply line where the pressure should be a minimum of 350 kPa (50 psig) and a maximum of 600 kPa (87 psig). A non return valve if necessary should be supplied by the customer if not otherwise stated in the contract.

Pump service liquid

TEMPERATURE

Optimal pump operation, for capacity and vacuum depth, is achieved by a water temperature of 60^{o}F. This temperature can be exceeded, if loss of capacity and vacuum depth is acceptable.

PRESSURE

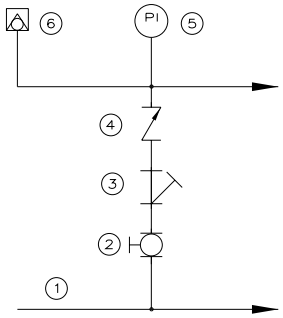
Connect the sterilizer to a supply line with a minimum pressure of 250 kPa (36 psig) and maximum pressure of 600 kPa (87 psig).

HARDNESS

In order to minimize the sterilizer maintenance and service expenses the water hardness should not exceed 4 dH. A water softener is recommended where the water is harder than this.

Connection

A gauge is not required but contributes to easier supervision of the installation.



1	Main line	2	Shut-off valve
3	Strainer	4	Non-return valve
5	Pressure gauge	6	Anti-siphon device

Steam

Sterilizers not equipped with a built in steam generator must be connected to a central steam supply.

The user is obligated to arrange for safety valves in the steam supply line as directed.

The effectiveness of a steam sterilization is very much dependent on the characteristics of the steam used. Therefore some basic demands should be raised on the quality of steam supplying the sterilizers.

Steam generators based upon evaporation from high pressure hot water should not be used since the steam produced is of inferior quality for sterilization purposes.

Steam Quality

1. Solid particles such as welding pellets, graphite, rust flakes, sand etc. must not be present since the steam comes in physical contact with the goods to be sterilized.
2. Liquids, except from steam condensate, must not be present.

3. Gases will prevent a close contact between the steam and the micro-organisms and should be minimized as follows:
   - Hydrazine (N2H4), NMT 0.11 mg/kg steam.
   - Ammonia (NH3), NMT 5 mg/kg steam.
   - Air and/or non-condensable gases, NMT 7 ml per 200 ml condensate, formed by the steam-air/gas mixture.

4. Other chemicals such as softening residuals and similar particulates must not be present in sterilizing steam.
   - Salt content of NMT 1 mg/kg steam.

Analysis of condensate

An analysis of the condensate from the steam should provide a gauge of purity. The following should not occur in concentrations exceeding the values given in ppm condensate:.

Evaporation residuals 1.0ppm of which:

Silicone as SiO2	0.01 ppm
Iron	0.1 ppm
Cadmium	0.005 ppm
Lead	0.05 ppm
Other heavy metals	0.1 ppm
Chloride	0.1 ppm
Phosphate	0 ppm

Recommended pH value = 5 - 7

Suitable conductivity < 3 µS/cm (at 68°F)

Suitable hardness ≤ 0.1 dH

Pressure

Getinge sterilizers should be supplied with steam, pressure in the range of 36 to 43.5 psig as indicated by the sterilizer pressure gauge marked “Steam supply”.
Consult the installation drawing for appropriate information.

Permissible pressure fluctuations of NMT ± 1.45 psig.

If the steam supply line pressure exceeds the sterilizer working pressure, the user must install a pressure regulating unit and safety valve with relief pressure and sufficient blow off capacity.

Moisture content

Sterilizers should be supplied with dry saturated steam. The physical state “dry saturated”, is difficult to maintain in a practical application, and measurement followed by control of the moisture content is an awkward procedure.

The following information is based upon practical experience and will generally result in steam with a satisfactory moisture content. This practice will also prevent superheating, a state of steam which is hazardous in connection with sterilization because it does not contribute to the humidification necessary for inactivation of microorganisms.

Practical arrangements

1. Connect the sterilizer to a live steam line, not to an inadequately drained or inadequately vented “dead leg”. Long branch connections to sterilizers should be avoided.
2. Dimension the piping for a steam velocity of 125ft/sec at a pressure of 36 psig. If several sterilizers are connected to the same pipe, calculate with a simultaneity factor of 0.8.
3. The steam supply pipes should slope to a minimum ratio slope of 1/8” per foot in the flow direction.
4. Reducing valve(s), should be utilized in the supply line if the pressure is higher than specified in the installation drawing. The steam pressure upstream of the reducing valve should not fluctuate more than 10%. Do not reduce the pressure with a factor smaller than 0.5 in each stage. Use a second reducing valve for greater reduction ratio. Each reducing valve must be followed by a safety valve.

If the steam in the supply pipe is wet, include a water serarator as shown in Figure “A”, just before the reducing valve.

The safety valve exhaust pipe should have at least the same dimension as the valve exhaust connection and must not contain orifices,

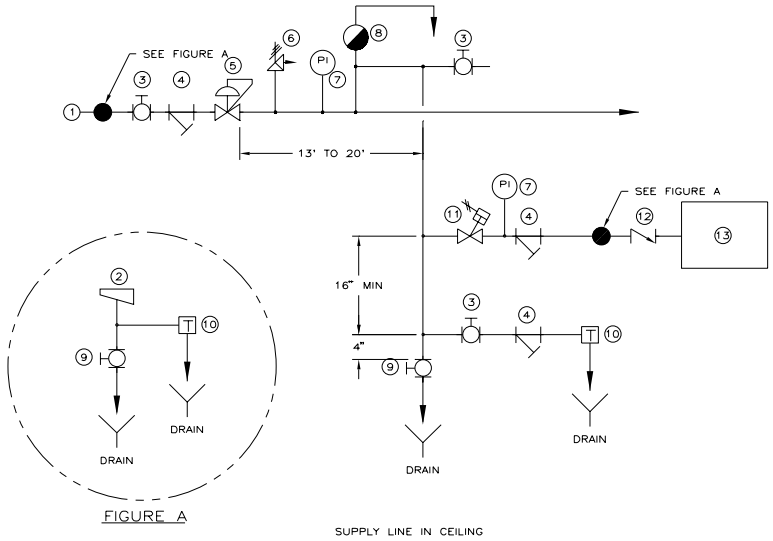
restrictions or shut off devices. Water pockets formed in the piping, must be drained.

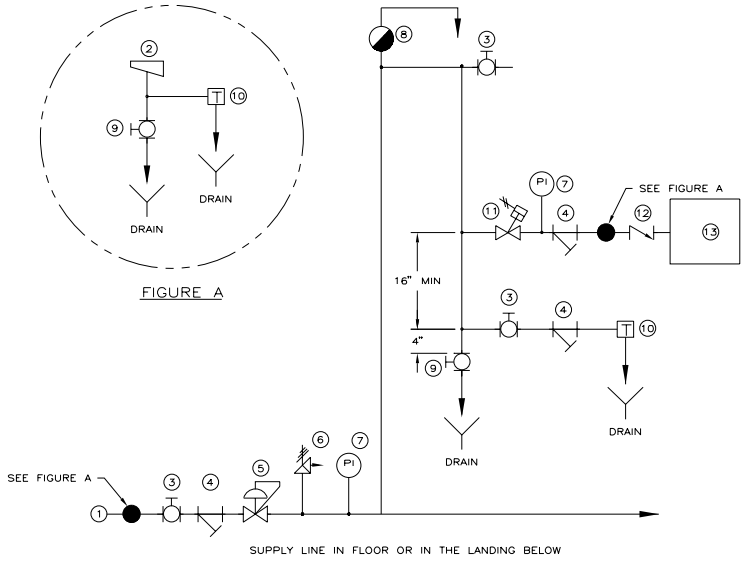
5. There must be no orifices or restrictions placed in horizontal pipes.
6. Fit the last reducing valve, a distance, not more than 20ft. piping away from the sterilizer, but not closer than 13ft. if the maximum reducing ratio of 2:1 is utilized.

If the reducing valve is positioned more than twenty feet from the sterilizer include a water separator, as shown in Figure "A", just before the sterilizer.

7. The last separator device (see figure below) should not be placed further than 3 feet away from the sterilizer steam intake.
8. No steam consumers other than sterilizers should be connected down-stream of the last reducing valve.
9. Branch pipes should be connected on top of the horizontal main pipe.
10. A connection should be provided between the reducing valve and sterilizer on the steam supply line to enable sampling steam for quality check.
11. Because of potential daily use, the shut off valve should be convenient to the operator.
12. Insulate steam pipes up to the sterilizer steam intake.

An arrangement according to the following figure normally satisfies the demand for dewatering, filtration and supervision facilities when supplying a sterilizer with steam from a main steam supply line.





1	High-pressure line	8	Vent
2	Labyrinth diverter / water separator	9	Ball valve
3	Shut-off valve	10	Steam trap
4	Filter	11	Remote-controlled valve
5	Reducing valve	12	Check valve
6	Safety valve	13	Sterilizer
7	Pressure gauge		

Compressed air

The air oil content should be less than 0.02 ppm and maximum permissible water content corresponding to the dew point at 50°F.

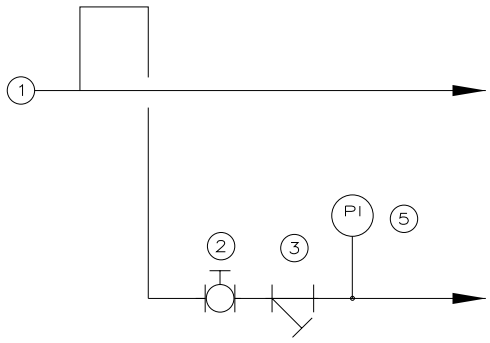
Less oil content may be required to satisfy quality demands on the final product.

Less water content may be required if compressed air pipes or air equipment is located in non-heated rooms.

Instrument air

The sterilizer is equipped with a pressure gauge for instrument air connected to the sterilizer.

- Connect the sterilizer instrument air supply fitting with a compressed air source capable of supplying air with a minimum pressure of 80.0 psig and a maximum pressure of 100.0 psig free of oil, water and solid particles as stipulated above.



1	Main supply	2	Shut off valve
3	Strainer	4	Pressure gauge

Chamber and door seal air

If the instrument air line is sufficient for the peak air consumption without causing a pressure drop below 80.0 psig the chamber air may be connected to the same air supply. A non return valve and sterile air filter, if required, should be supplied by the customer unless otherwise stated in the contract.

- Connect the sterilizer chamber air supply fitting, via a shut off valve, to a compressed air source capable of supplying air with a minimum pressure of 43.5 psig and a maximum pressure of 100.0 psig. The air should be sterile, filtered and free from oil and water as stipulated above.

Exhaust from safety valve

Safety valves with a small relief opening are provided with exhaust pipes leading the blown off steam or air to a safe position in the service area, as defined in ASME Section 8, Div 1. UG - 135.

Safety valves with larger relief openings are not provided with exhaust pipes at delivery.
The reason for this is, that when there is the possibility of a large volume of steam / air being exhausted, it is advisable to have this piped to a safe area where no personnal injury could take place. Refer to OSHA or State laws concerning this.

An exhaust pipe system connected to the safety valve:

- **must** be at least the same size as the safety valve

- **must NOT** contain shut-off valves or other throttling devices
- **must** be designed to avoid the forming of water pockets or, if this is not possible, provided with drain lines.

WARNING! The outlet from the safety valve must be connected to a pipe leading the exhaust to a safe position.

Drain

Sterilizers equipped with more than one waste water connection should have all piped separately to the floor drain.

Check local regulations regarding the drain arrangements, (gas residuals in the water, temperature limits, etc.).

Because most industrial sterilizers release their pressure through the autoclave drain, an air/water separator should be installed to prevent water splashing in the service area.

- Run a sloping pipe from the outlet with unreduced bore to the drain where it should terminate not closer than two pipe diameters (air gap) above the surface level of the floor by the water trap.
- The discharge pipe from a steam generator should be fixed at its open end which should be at least a pipe length of 2ft. away from the discharge valve.
- Arrange for cooling (below 140^{o}F) the discharge pipe when emptying the steam generator to comply with regulations and in order to avoid steaming and noise in the room.

Ventilation

The sterilizer ambient temperature should be kept at 60 - 95°F.

Functional test prior to use

A functional test prior to use should be carried out according to the service manual.

OPERATING INSTRUCTION

This operating instruction is intended for the daily use of the sterilizer.

One copy, together with one copy of the program combination and passwords are provided to the designated contact person in a sealed envelope.
The operating instructions and program combination sheet are to be available for the operator when working at the control panel.

6. OPERATING INSTRUCTION

This sterilizer must not be used for processing other material than stated in the program combination list.

Pathogenic material must not be sterilized in this sterilizer.

Beware of hot surfaces inside the sterilizer chamber when door is open!

Preoperation checks

- Check that valves for cold water, compressed air and steam are open.
- Switch on the power switch.

Sterilizing

- Check that there is sufficient recording paper for the entire process
- Load the sterilizer.
- Place the temperature probes for the intended cycle in the load.
-
- Check that the steam supply is at least 270 kPa (40 psig).
- Close the door by pushing the button ”Close Door”.
- Select the desired cycle and comfirm the parameters as described in the CONTROL UNIT chapter of this manual.
- Push the ”Start” button.
- On completion of a satisfactory process, the light indicator on the “Open Door” pushbutton illuminates. Push the ”Open Door” pushbutton.
- Select immediately new program if the same one should not be used next time.

Close down

Unless otherwise prescribed by local rules:

- Switch off the control unit power switch.
- Check and clean the chamber drain strainer.
- Shut off supplies for cold water, steam and compressed air.

Blowing safety valve

- Press the EMERGENCY STOP button.
- Call for a technician.

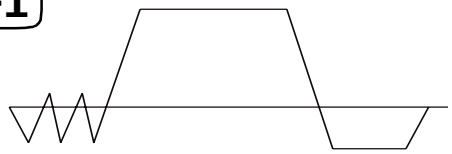
GETINGE Castle

Program combination

ALLEN BRADLEY

Textiles, plastic and rubber products

F1



PARAMETER	RANGE	DEFAULT	ACTUAL
1. Pre-vac pulses	1 - 99	3	3
2. Sterilizing temp	105 - 135°C	135°C	135°C
3. Sterilizing time	0 m - 99 h	3 m	3 m
4. Drying time	0 m - 99 h	10 m	10 m

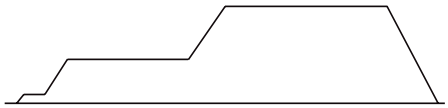
Insitu Filter

F2

PARAMETER	RANGE	DEFAULT	ACTUAL
1. Sterilizing temp	105 - 135°C	121.1°C	121.1°C
2. Sterilizing time	0 m - 99 h	5 m	5 m
3. Drying time	0 m - 99 h	5 m	5 m

Liquids AOP

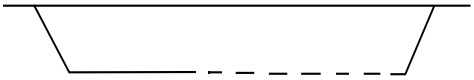
F3



PARAMETER	RANGE	DEFAULT	ACTUAL
1. Sterilizing temp	105 - 135°C	121.6°C	121.6°C
2. Sterilizing time	0 m - 99 h	15 m	15 m
3. Fo setpoint	0 - 999.9	999.9	999.9
4. Cooling temp	60 - 95°C	80°C	80°C

Automatic Leak rate Test

F4



PARAMETER	DEFAULT
1. Leak rate	0.5psi
2. Leak time	1 hour

Liquids must be processed with appropriate liquid program only.
Hazardous waste and explosive materials must not be processed in this sterilizer.

RAX014/US-AB
Rev.F
7/97

7. CONTROL UNIT - ALLEN BRADLEY

The object of the control system is to produce commands and transmit information to the sterilizer components enabling for a number of sterilization processes to be accomplished in accordance with a predicted pattern. The command signals are generated by the control unit computer program in combination with measurements of the process parameter values. The latter consist mainly of times, temperatures and pressures.

Various equipment can be connected to the control unit for programming, monitoring and recording the sterilization processes.

The operator communicates with the control unit via a control panel. The entire process is controlled by an Allen Bradley SLC 504 microprocessor control system.

The Allen Bradley SLC 504 control system is made up of the Control Processing Unit (CPU) and a Panelview504 Operator Interface Panel. This panel contains status indicator lights and display while serving as the operator interface for cycle selection and cycle parameter input. Visual indication of the process appears as a read-out on the display.

Documentation of programs, system definitions and process data can be made by connecting a printer. A host computer can also be connected direct to the control unit CPU.

The computer contains a program section for calibration of temperature and pressure transducers. Correction constants, when known, may be entered manually. Among available test functions there are facilities for activating analog and digital outputs and monitoring analog and digital inputs. The maximum programmable digits are 9999.

The hardware of the sterilizer control system contains the operating panels easily locate in a suitable place. The CPU and power pack are placed in a separate electrical enclosure, connected to the operating panels.

Some terms of the branch

STERILIZATION means the whole series of treatments to form a process in order to attain total killing of all viable organisms. This is in connection with autoclaves usually made up by air removal, heat treatment and a drying phase.

STERILIZING means the actual killing part, the heat treatment, of the total process.

Analogous to the two expressions above, STERILIZATION TIME means the durability of the total process from the start until the goods can be unloaded. PROCESS TIME is equal to sterilization time.

STERILIZING TIME represents that part of the process only during which the programmed STERILIZING TEMPERATURE prevails in the chamber.

PARAMETER in this context means the ELEMENTS WHICH INFLUENCE the sterilization course. Examples of parameters in the sterilization process are temperature, pressure, time, gas concentration, etc. The PARAMETER VALUES may be fixed in the program or operator adjustable.

F_0-VALUE is a time defined by the equation

$$F_0 = \int_0^t 10^{\frac{T_{(t)} - k_1}{k_2}} \times dt$$

t = Time in minutes

T(t) = Load temperature at time t

k_1 = Constant within the range 0.0 - 150.0 ^oC. Usually 121.1 ^oC

k_2 = Constant within the range 0.0 - 99.9 ^oC. Usually 10.0 ^oC

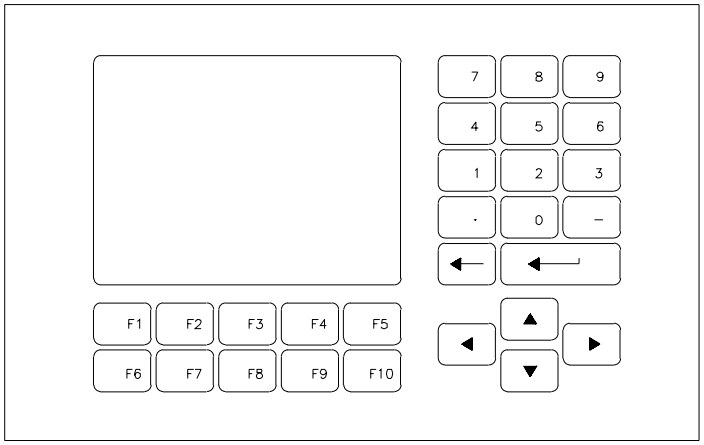
The F_0. value is based upon the sterilizing time, required for the temperature prevailing in each moment, being recalculated to the base temperature for steam sterilization, 121.1^oC

The use of F_0 value is most common in the pharmaceutical field, where often the time control of sterilization processes is based upon this value, thereby utilizing the heat applied during heating up and cooling down. By this method, heat sensitive products do not need to be exposed to high temperatures for a longer period of time than required in obtaining a sterile result.

Operating panel SLC 504

By means of the SLC 504, the operator selects program, alter parameter values, starts and monitors the processes and receives information about possible errors occurring with the sterilizer.

The SLC 504 control panel will not allow for such programming of the cycle, such as making new processes or altering programs already resident in the CPU.



Display

The 256 x 128 pixel display is the liquid crystal type. The backlight is field replaceable to extend the life of the terminal.

Front Panel

The SLC 504 control panel consists of multiple touch keys for operator interface.

- Numeric keypad with decimal and underline.
- Function keys for F1 through F10 selection.
- Scroll arrow keys to move the cursor left or right ←→ and up or down ↑↓.
- ENTER key ↵.
- Backspace key ←

Rear Panel

The back of the SLC 504 control panel contains two I/O Terminal Ports.

- Remote I/O port to connect a remote I/O Network.
- RS-232 port allowing connection to a RS-232 port of a computer for information transfer.

Push Buttons/Indicator Lights - Load Side

Emergency Stop/ Abort	This push button is used to discontinue a cycle. Once depressed, the outputs of the control system will be turned off disabling the sterilizer. At this time, a key must be used to unlock the emergency stop button. To unlock the emergency stop, turn the key. The button will move outward to reset. The operator must then acknowledge the alarm via the function keys located on the Allen Bradley display.
Alarm Acknowledge	This push button is pressed to acknowledge any alarm prior to continuing or aborting a cycle. This push button is also used to acknowledge that the sterilizer is unloaded after closing the door on the unload side.
Control Power ON/OFF	This selector switch controls power to the OFF position, all digital outputs are turned off disabling the sterilizer. During normal operation, the switch should be in the ON position.
Open Door	This push button is used to open the sterilizer door after a cycle has ended. When illuminated, it signals to the operator that the door can be opened.
Close Door	This push button is used to close the door. It must be pressed and held the entire time that the door is in motion. The door will reverse to the open position if the button is not held.

Push Buttons/Indicator Lights - Unload Side

Emergency Stop/ Abort	This push button is used to discontinue a cycle. Once depressed, the outputs of the control system will be turned off disabling the sterilizer. At this time, a key must be used to unlock the emergency stop button. To unlock the emergency stop, turn the key. The button will move outward to reset. The operator must then acknowledge the alarm via the function keys located on the Allen Bradley display.
Alarm Acknowledge	This push button is pressed to acknowledge any alarm prior to continuing or aborting a cycle. This push button is also used to acknowledge that the sterilizer is unloaded after closing the door on the unload side.
Open Door	This push button is used to open the sterilizer door after a cycle has ended. When illuminated, it signals to the operator that the door can be opened.
Close Door	This push button is used to close the door. It must be pressed and held the entire time that the door is in motion. The door will reverse to the open position if the button is not held.
Cycle In Progress	This indicator light identifies the cycle is in progress.

Passwords

Six passwords exist in the Allen Bradley and consists of five digits 0000 - 99999. The password sections are:

- Parameters
- Cycle Start
- Cycle Time & Date
- Service
- Calibration
- Master Password

Passwords at delivery:

The passwords set in the control system is revealed in a special document delivered in a sealed envelope together with the sterilizer manuals.

Detailed screen displays

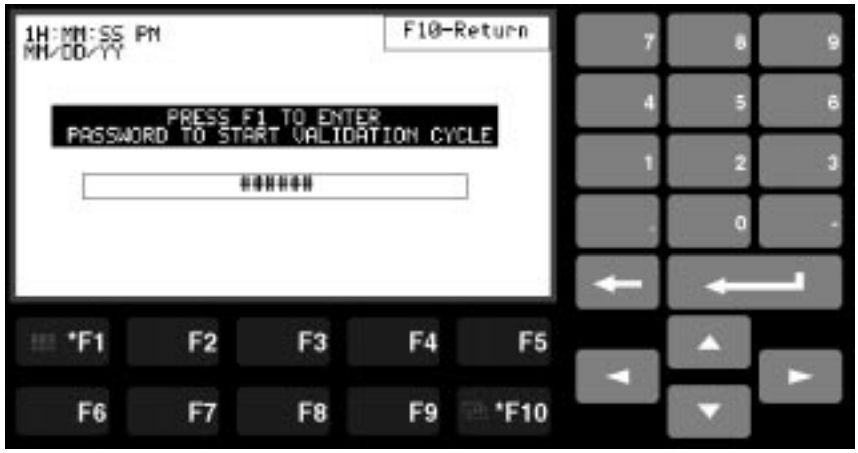
Main Menu

Upon start-up of the sterilizer, the main menu of the display will appear as shown below. Functions such as cycle selection, start cycle, runtime screen, change cycle parameters, alarms, and service information can be accessed through the main menu.

Us the up or down arrows located on the panelview keypad to select the next display frame. Press return to acknowledge and advance to the selected display frame.

Load Door Main Screen

This screen allows for the selection of the Validation Password Screen to allow the operation of a cycle from the opposite door. The correct password must be entered for the following displayed on the Unload Door.



Unload Door Main Screen

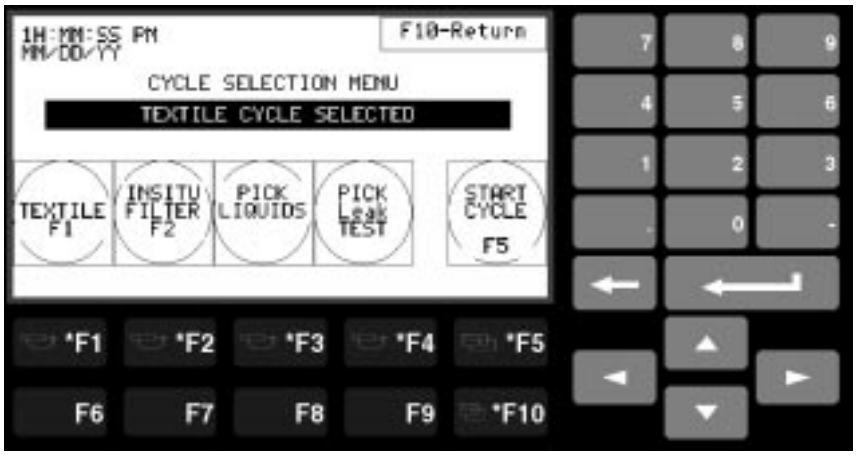
.

GETINGE
MAIN MENU
CYCLE SELECTION
START CYCLE
RUNTIME SCREEN
CHANGE CYCLE PARAMETERS
ALARM SCREEN
SERVICE SCREENS
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
7
8
9
4
5
6
1
2
3
0

Cycle Selection/Start Cycle

In the Cycle Selection menu screen, select the type of cycle to be run by pressing the appropriate function key (F1, F2, etc.). The type of cycle selected will appear in the highlighted box. Press F5 to start the cycle.

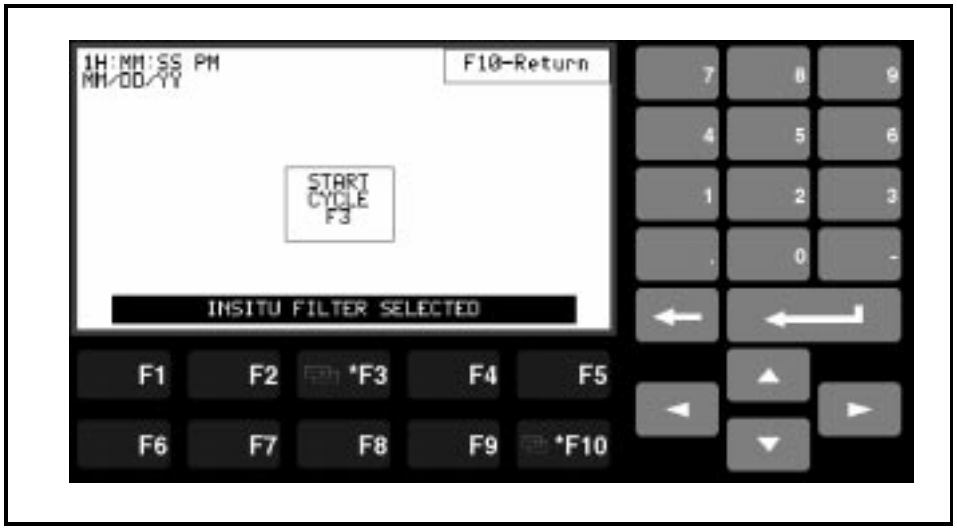
.



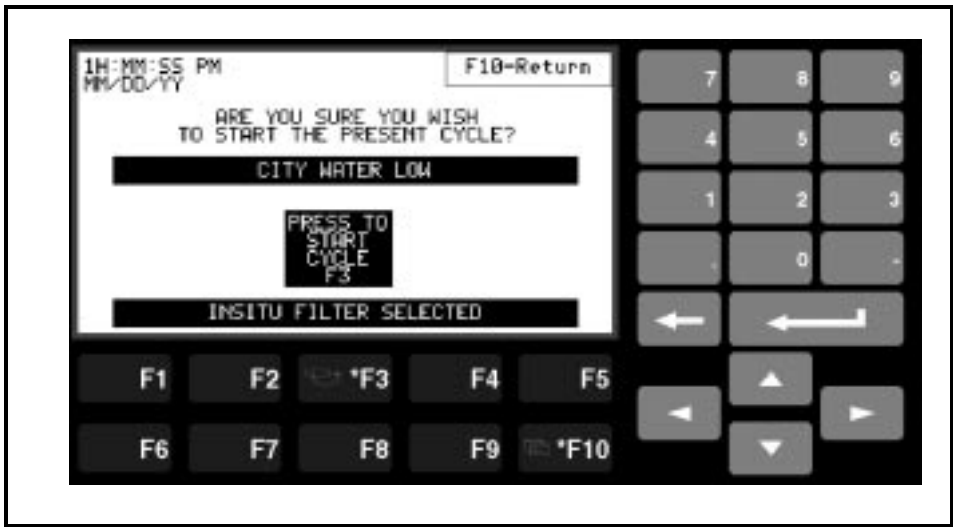
Cycle Start

The display will then ask the operator to verify start of the cycle. Press F3 to acknowledge the start of the cycle. The sterilizer's door will then be sealed and locked initiating the cycle.

.



Following the selection of F3, the following confirmation screen will appear:



Runtime Screen

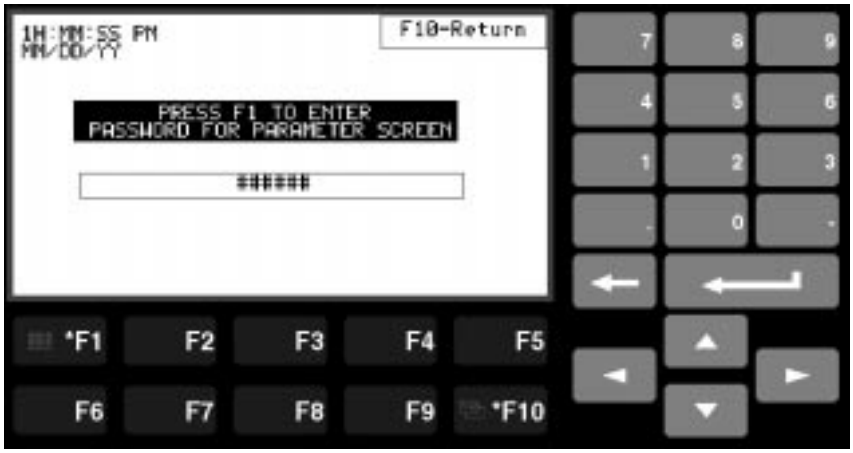
The Runtime screen allows the operator to observe the conditions during the sterilizer cycle such as temperature, pressure, etc. This display is accessed through the main menu via the up or down arrow keys followed by pressing the return button

.

Cycle Parameters

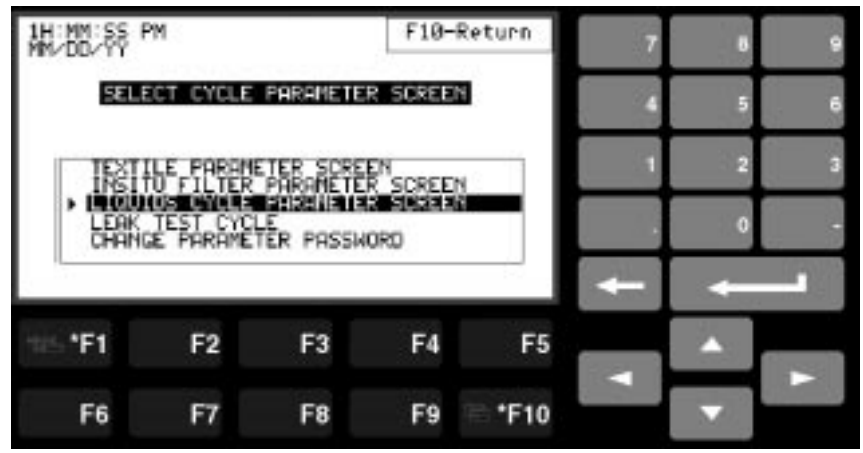
The Change Cycle Parameter display screen is used to alter parameter setpoints of the cycle to be run such as sterilization time and temperature. This display is accessed through the main menu. Use the up or down arrow keys followed by pressing the return key to access this display. A password is required to access the Change Parameter display. Press F1 to enter the password. Enter the password using the numeric keys followed by pressing the return key.

.



Select the cycle in which the parameters are to be altered. Use the up or down arrow key to select the cycle followed by pressing the return key.

.

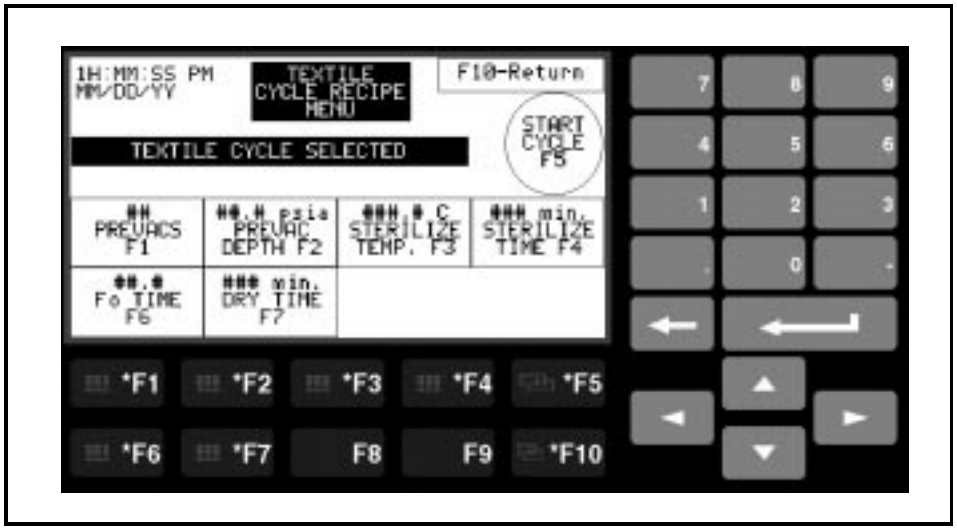


Change Parameter

In the Change Parameter display, the current parameter settings will be displayed. To alter a parameter, press the appropriate function key (F1, F2, etc.). Enter the parameter value using the numeric keys followed by pressing the return key. Decimal points are not required in entering the new value. A cycle may be started from this display screen by pressing F5.

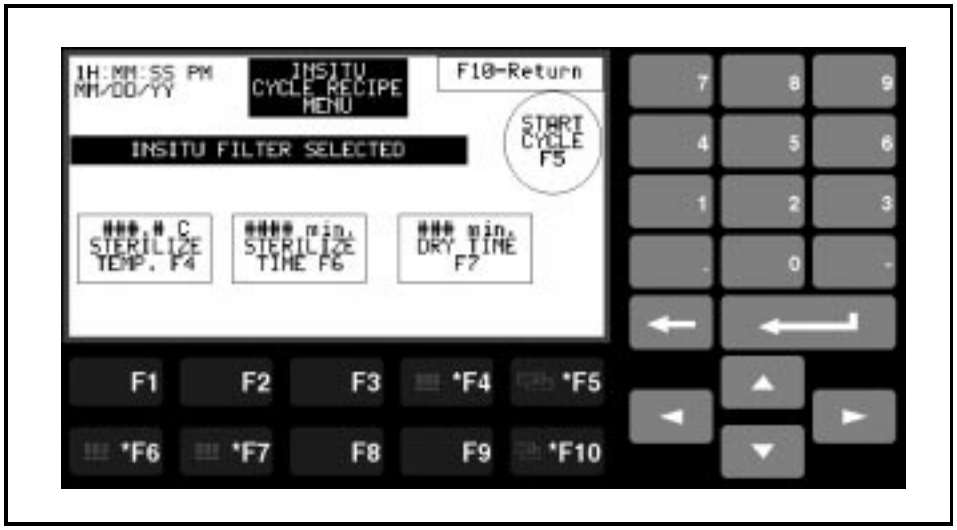
Textile Cycle:

.



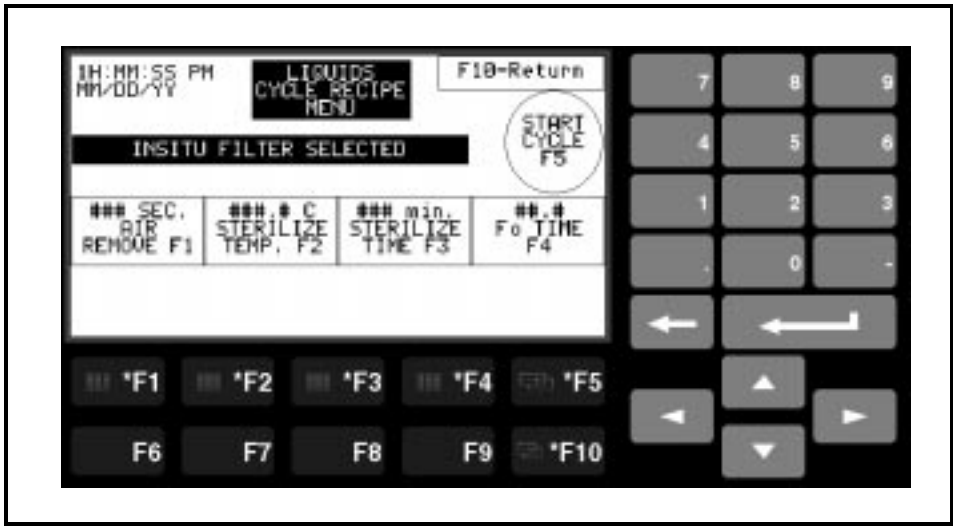
Insitu Cycle:

.



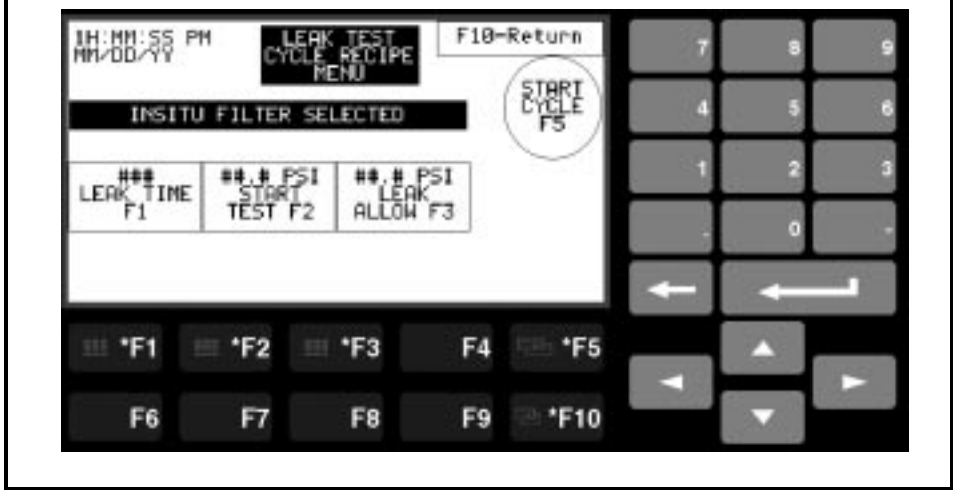
Liquid Cycle:

.



Leak Test Cycle:

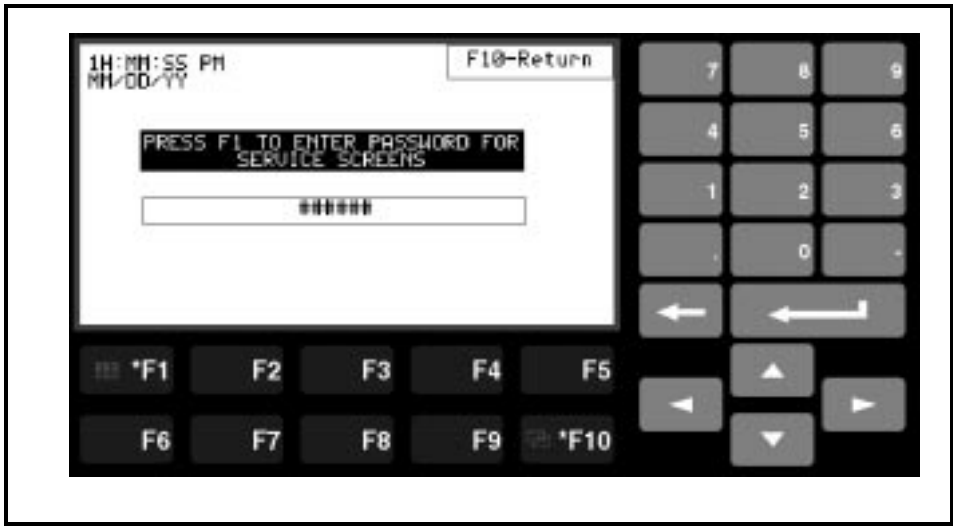
.



Parameter Password Screen

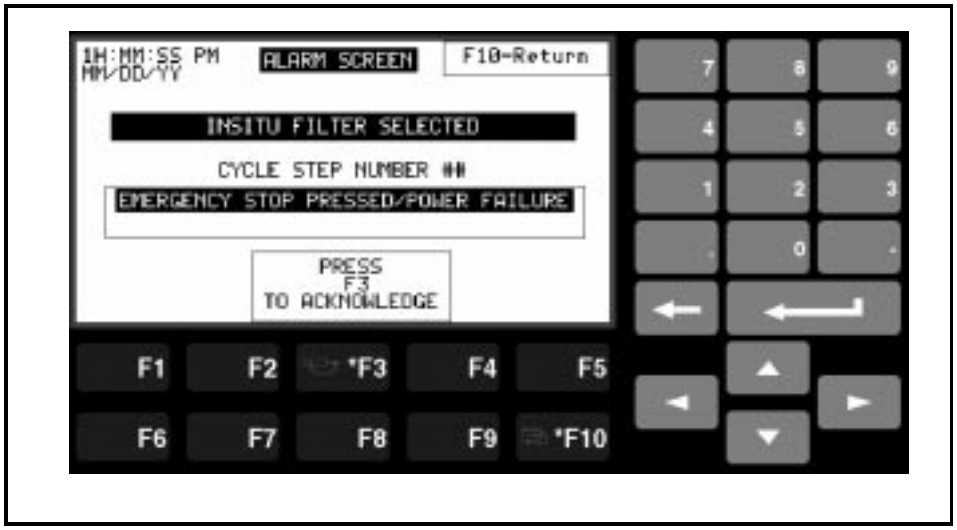
In the Change Password Screen, the operator can set or change the parameter password. To set or change the parameter password, press F1. Enter the password by using the numbered keys followed by pressing the return key.

.

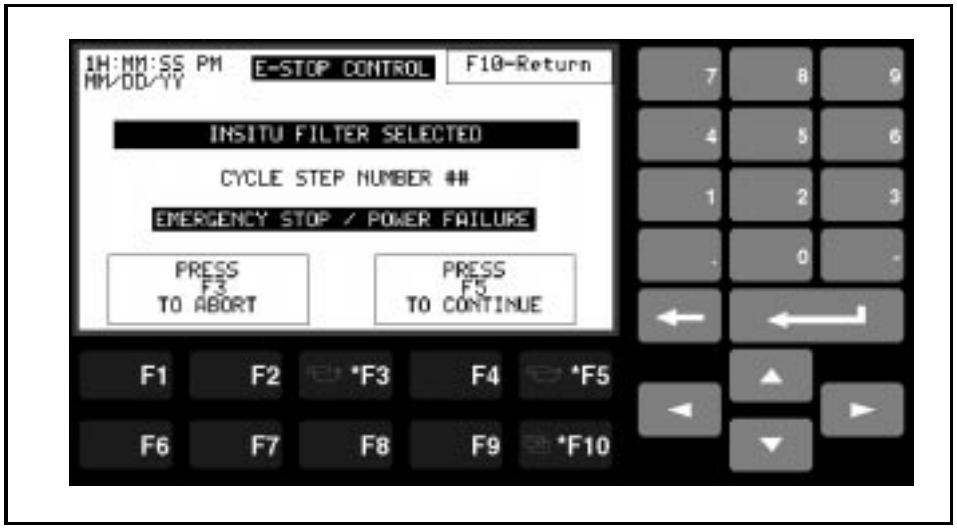


Alarm Display

In the event an alarm condition occurs during a cycle, the Alarm display screen will appear. The type of alarm will be displayed in the high-lighted box. Any alarm or aborted cycle must be acknowledged to the control system. Acknowledge the alarm by pressing F3. The system will then ask the operator to continue the cycle or abort the cycle. Press F3 to abort the present cycle or F5 to continue the present cycle.

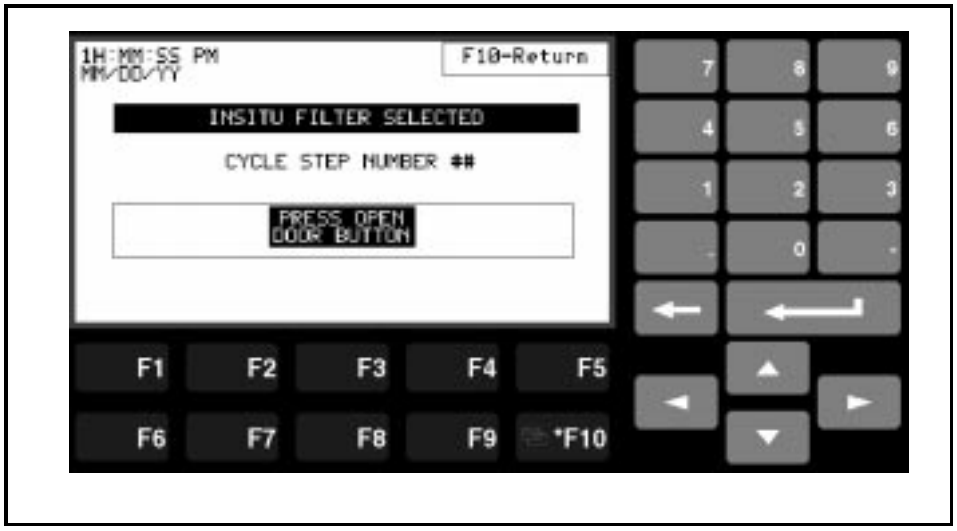


Emergency Stop Alarm Screen:



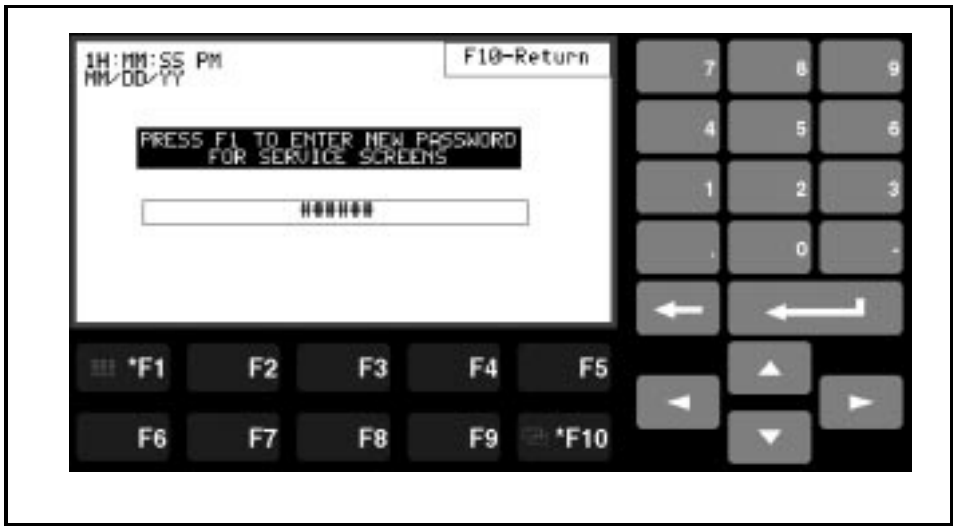
System Information

The System Information display screen will identify information about the cycle progress.

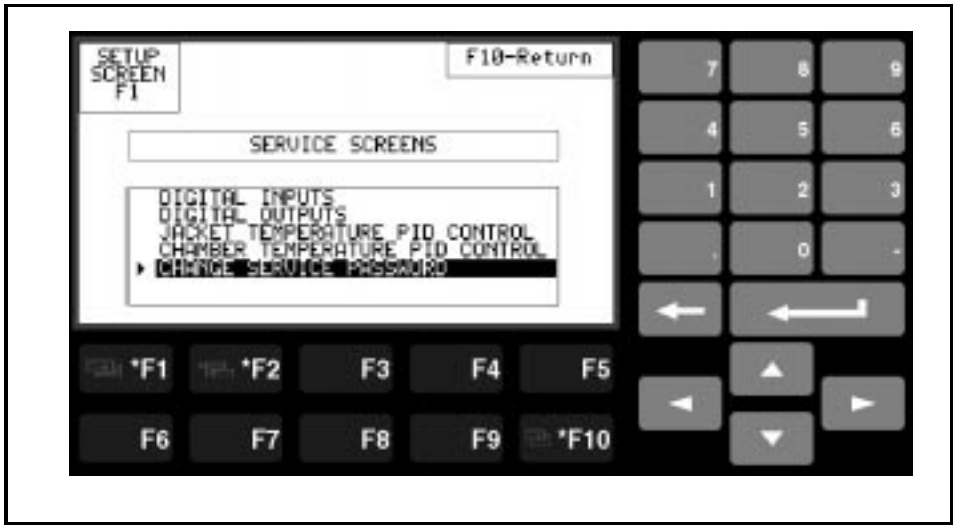


Service Screen

The Service display screen is used for service and maintenance functions such as monitoring control value, I/O checks and manual control of the sterilizers. The service display screen is accessed through the main menu by the use of the up or down arrow keys followed by pressing the return key. A service password is required to access the service display screens. Press F1 to enter the service password. Enter the password by using the numeric keys followed by pressing the return key.

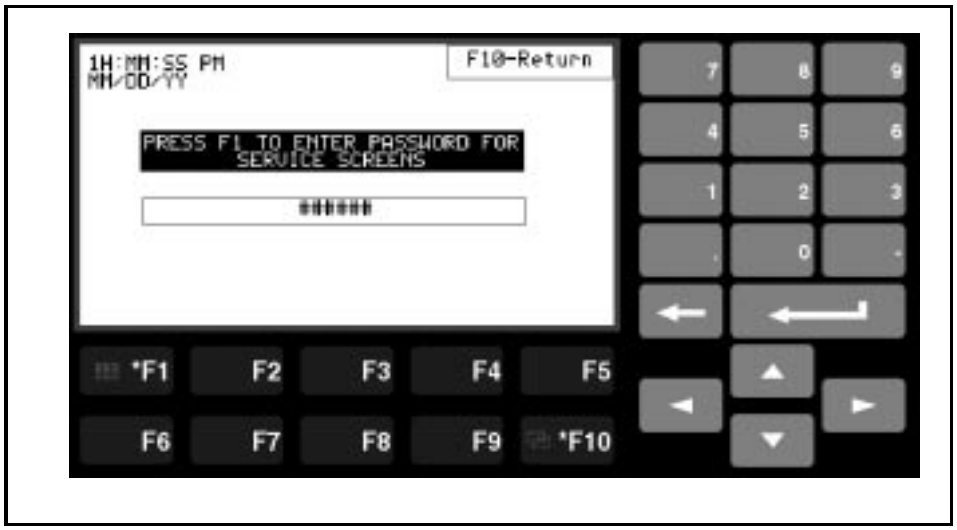


In the Service display screen, the up or down arrow keys are used to select the sterilizer components to be monitored and/or altered. Press the return key to access the display screens for these functions.



Service Screen Passwords

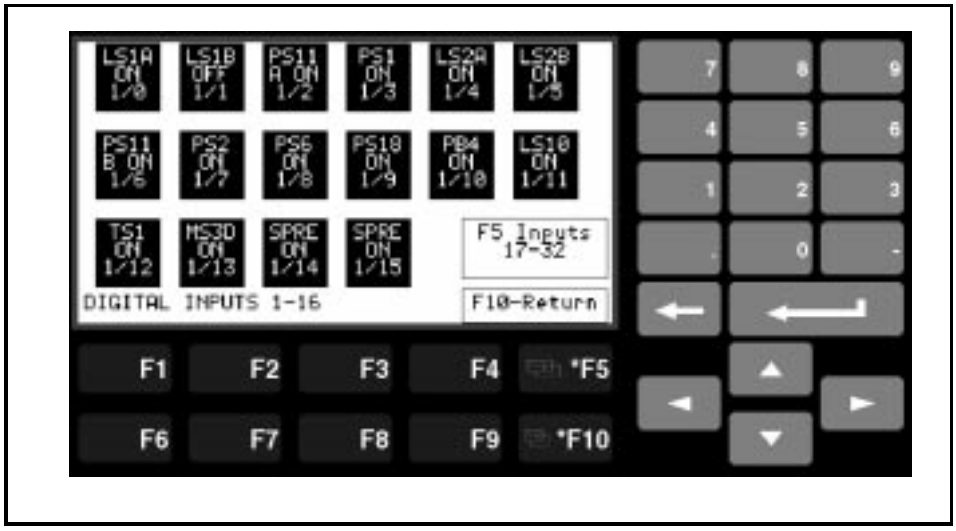
In this display scree, the user can change the service password. To change the current service password, press F1. Enter the new password using the numeric keys followed by pressing the RETURN key to enter the password. The system will then ask the user to verify the password. Re-enter the password followed by pressing the RETURN key.

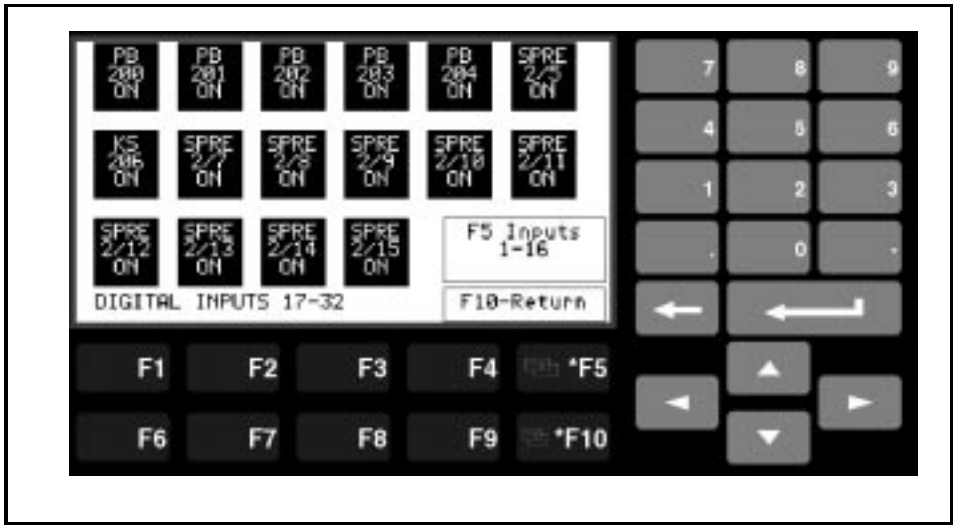


Digital Inputs

In the Digital Input display, the user can observe the system's digital inputs as they are energized. An illuminated box indicates that the device is on and providing input to the controller.

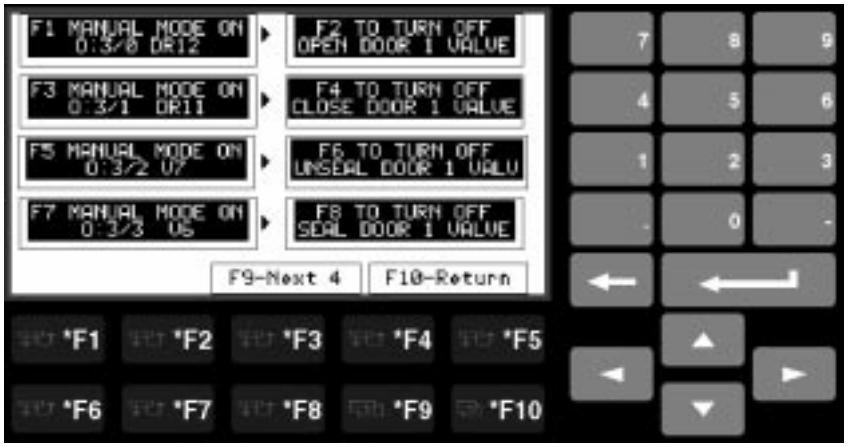
.



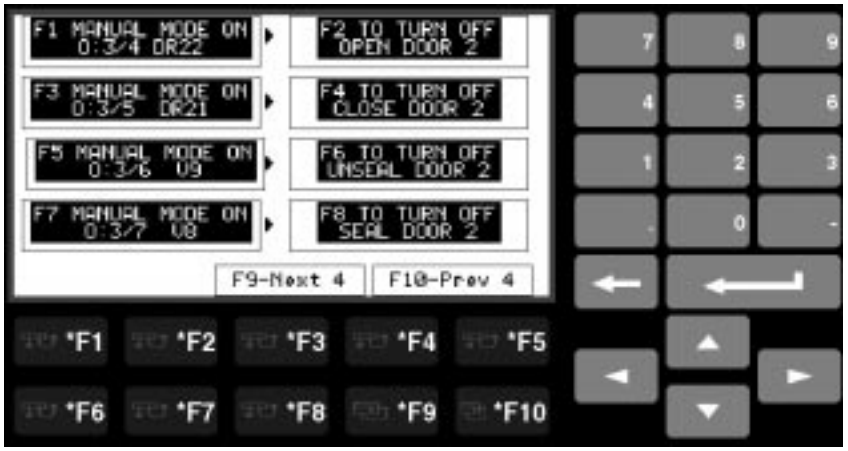


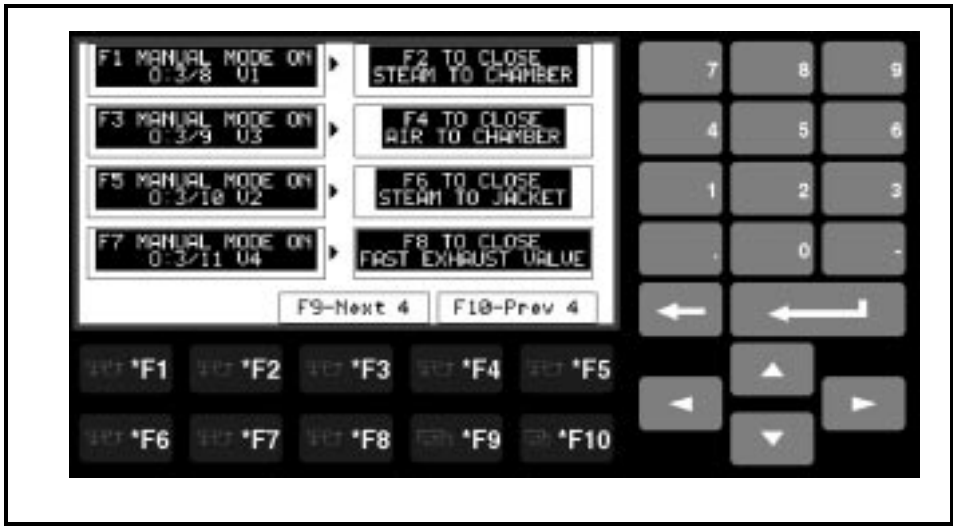
Digital Outputs

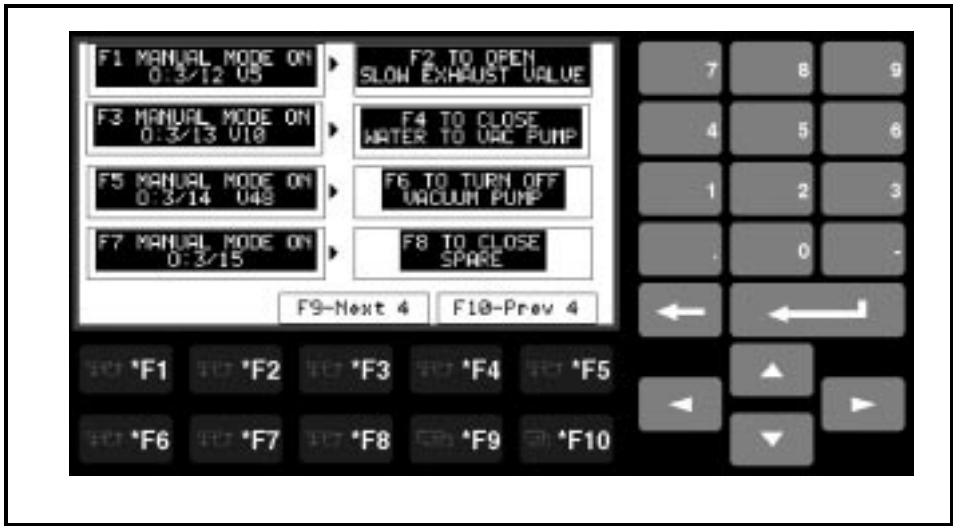
In the Digital Output display, the user can manually override devices, such as opening valves, once the device is in the manual mode. For each digital output display, the left-hand column and associated function keys will place the selected device in the manual mode when pressed. The right-hand column and associated function keys will physically turn the device on or off when pressed. An illuminated box represents the device in ON.

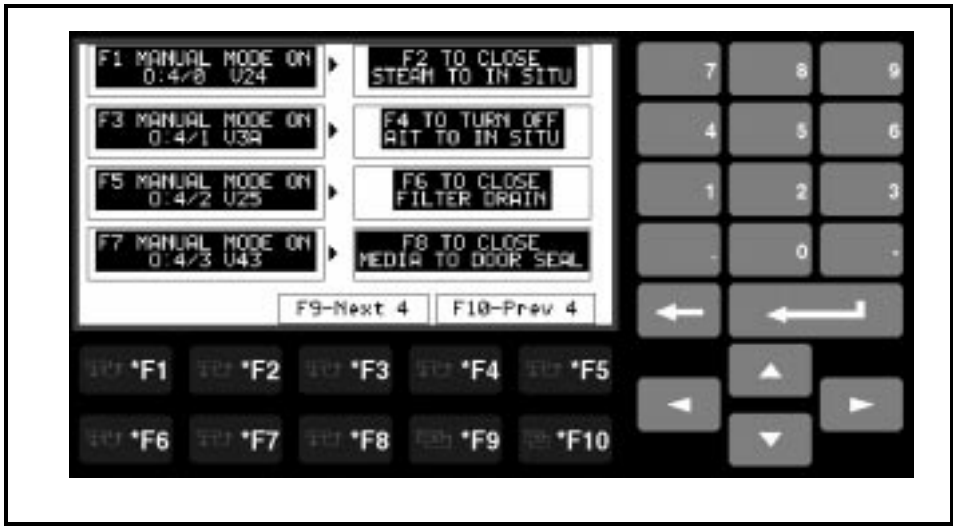


.

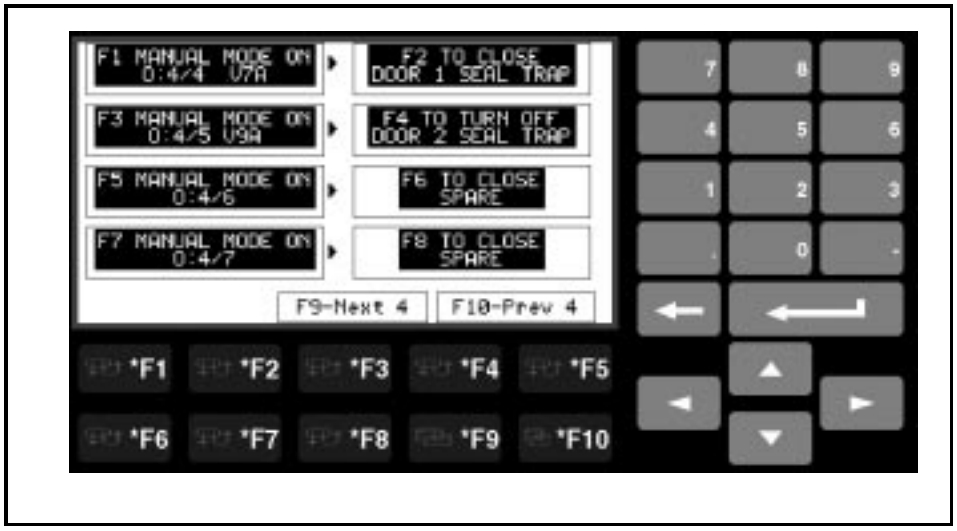



F1 MANUAL MODE ON
0:3/8 V1
F2 TO CLOSE
STEAM TO CHAMBER
F3 MANUAL MODE ON
0:3/9 V3
F4 TO CLOSE
AIR TO CHAMBER
F5 MANUAL MODE ON
0:3/10 V2
F6 TO CLOSE
STEAM TO JACKET
F7 MANUAL MODE ON
0:3/11 V4
F8 TO CLOSE
FAST EXHAUST VALVE
F9-Next 4
F10-Prev 4
*F1
*F2
*F3
*F4
*F5
*F6
*F7
*F8
*F9
*F10
7
8
9
4
5
6
1
2
3
.
0
-


F1 MANUAL MODE ON
0:3/12 V5
F2 TO OPEN
SLOW EXHAUST VALVE
F3 MANUAL MODE ON
0:3/13 V10
F4 TO CLOSE
WATER TO VAC PUMP
F5 MANUAL MODE ON
0:3/14 V48
F6 TO TURN OFF
VACUUM PUMP
F7 MANUAL MODE ON
0:3/15
F8 TO CLOSE
SPARE
F9-Next 4
F10-Prev 4
*F1
*F2
*F3
*F4
*F5
*F6
*F7
*F8
*F9
*F10
7
8
9
4
5
6
1
2
3
.
0
-

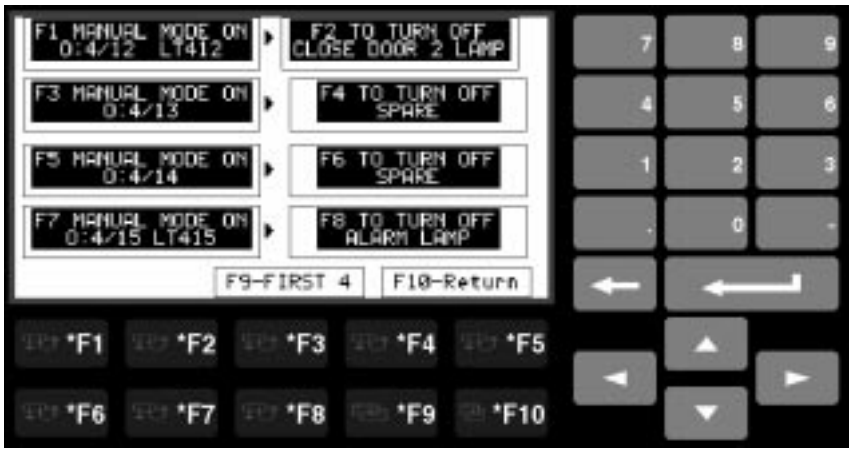

F1 MANUAL MODE ON
0:4/0 V24
F2 TO CLOSE
STEAM TO IN SITU
F3 MANUAL MODE ON
0:4/1 V3A
F4 TO TURN OFF
AIT TO IN SITU
F5 MANUAL MODE ON
0:4/2 V25
F6 TO CLOSE
FILTER DRAIN
F7 MANUAL MODE ON
0:4/3 V43
F8 TO CLOSE
MEDIA TO DOOR SEAL
F9-Next 4
F10-Prev 4
*F1
*F2
*F3
*F4
*F5
*F6
*F7
*F8
*F9
*F10

.


F1 MANUAL MODE ON
0:4/4 V7A
F2 TO CLOSE
DOOR 1 SEAL TRAP
F3 MANUAL MODE ON
0:4/5 V9A
F4 TO TURN OFF
DOOR 2 SEAL TRAP
F5 MANUAL MODE ON
0:4/6
F6 TO CLOSE
SPARE
F7 MANUAL MODE ON
0:4/7
F8 TO CLOSE
SPARE
F9-Next 4
F10-Prev 4
*F1
*F2
*F3
*F4
*F5
*F6
*F7
*F8
*F9
*F10

.

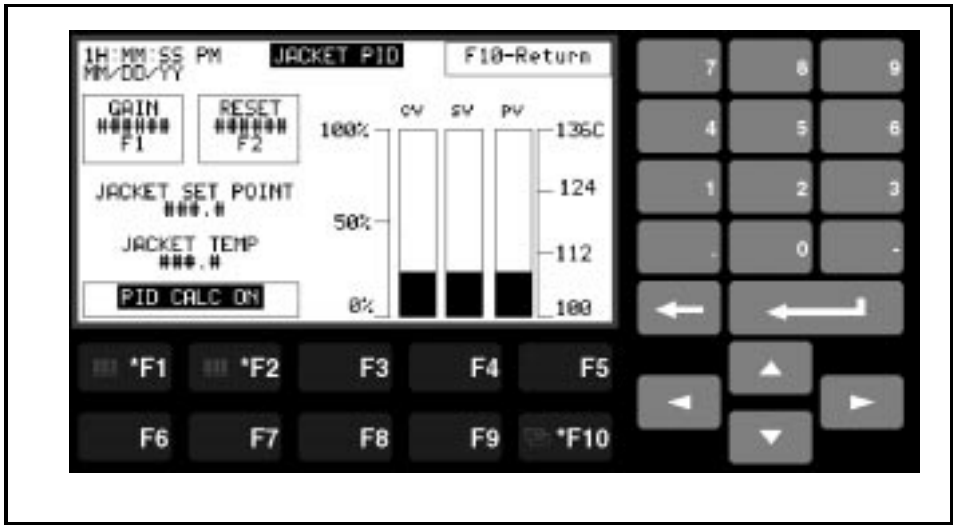
F1 MANUAL MODE ON
0:4/08 CR408
F2 TO TURN ON
NO ALARM
F3 MANUAL MODE ON
0:4/9 LT409
F4 TO TURN OFF
DOOR 1 OPEN LAMP
F5 MANUAL MODE ON
0:4/10 LT410
F6 TO TURN OFF
DOOR 1 CLOSED LAMP
F7 MANUAL MODE ON
0:4/11 LT411
F8 TO TURN OFF
OPEN DOOR 2
F9-Next 2
F10-Prev 4
*F1
*F2
*F3
*F4
*F5
*F6
*F7
*F8
*F9
*F10
7
8
9
4
5
6
1
2
3
.
0
-


F1 MANUAL MODE ON
0:4/12 LT412
F2 TO TURN OFF
CLOSE DOOR 2 LAMP
F3 MANUAL MODE ON
0:4/13
F4 TO TURN OFF
SPARE
F5 MANUAL MODE ON
0:4/14
F6 TO TURN OFF
SPARE
F7 MANUAL MODE ON
0:4/15 LT415
F8 TO TURN OFF
ALARM LAMP
F9-FIRST 4
F10-Return
*F1
*F2
*F3
*F4
*F5
*F6
*F7
*F8
*F9
*F10
7
8
9
4
5
6
1
2
3
.
0
-

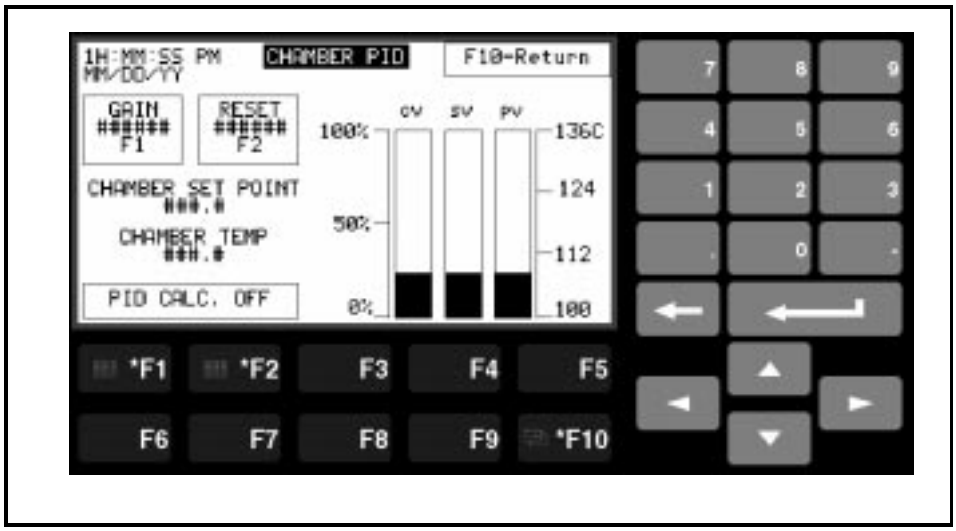
PID Control

In either the Jacket PID or the Chamber PID display screen, the user can observe the operation of the valve which controls steam to the chamber or jacket. The proportional gain and reset values used to maintain temperature control can be altered from this display. To alter one of the parameters, press the appropriate function key. PRess F3 to alter the PROPORTIONAL GAIN value or F2 to alter the RESET value. Enter the new value using the numerical keys followed by pressing the RETURN key to enter the value.

Jacket PID



Chamber PID



Alarm and System Messages - Troubleshooting

Note:

All alarms and system messages must be acknowledged to silence the alarm and clear the display. Fatal errors will interrupt the cycle. The cycle will not be interrupted when a non-fatal error occurs. Acknowledging the error will not interrupt the cycle. When troubleshooting, ALWAYS refer to the wiring diagram for the unit being serviced. Also see the Input/Output table in the Appendix.

SERVICE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY.

Information Text

The following messages are displayed on the display panel. Typically the “CYCLE RESTARTED” and “CYCLE ABORTED” messages will also be printed to the printer

CYCLE ABORT	This message will be displayed if, following pushing Emergency Stop button and then restoring the power, the operator elects to abort the current cycle by pushing the OPEN DOOR button. See Emergency Stop below.
SEALING DOOR #1	This message will be displayed on the display panel once all start conditions are satisfied and the start button is pressed. When Door #1 is fully sealed, the message is no longer displayed.
SEALING DOOR #2	This message will be displayed once all start conditions are satisfied and the Start button is pressed. When Door #2 is fully sealed, the message is no longer displayed.
UNSEALING DOOR #1	During the Cycle End phase, this message will be displayed as the Load Door is unsealed.
UNSEALING DOOR #2	During the Cycle End phase, this message will be displayed as the Unload Door is unsealed.
CYCLE COMPLETE	During the Cycle End phase, this message will be displayed after the chamber has returned to atmospheric pressure.
CYCLE RESTARTED	This message will be displayed if, following pushing the Emergency Stop button and then restoring the power, the operator elects to continue the current cycle by pushing the CONTINUE button on the Alarm Display. See Emergency Stop below.
UNLOADING	This message will be displayed during the Cycle End phase while the unload door is opened.
PRESS OPEN - LOAD	This message will be displayed during the Cycle End phase once the unload door has been closed again following unloading the Load Door may be opened.
OPEN DOOR	This message will be displayed during the Cycle End phase once the Load Door seal has been pulled and the door is ready to be opened.

Alarm List

EMERGENCY STOP

Message Display:

EMERGENCY STOP

This alarm is activated when the Emergency Stop pushbutton is activated from the fascia panel. All digital outputs except for the alarm and Acknowledge Alarm lamp will be turned off. The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the emergency stop alarm screen on the PanelView 900 operator terminal. The alarm will be printed if the unit is in cycle.

Operator Acknowledgement:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing, but remain illuminated. All outputs remain off.

The Emergency Stop button must be reset by inserting the key and twisting in the clockwise direction. The cycle may be aborted or continued by pressing the appropriate button area of the touch screen display. When a cycle is aborted, the sterilizer will advance to the post conditioning phase of the cycle allowing the sterilizer to advance to a safe condition. When a cycle is continued, the process will return to the condition at the point when the alarm was activated and continue the cycle.

CHAMBER TEMPERATURE SENSOR ERROR

Alarm Condition:

The probe is out of the allowable range of -5.0^{o}C to 150^{o}C

Message Display:

CHAMBER TEMP OUT OF RANGE

This alarm will turn off all digital outputs except for the alarm and Acknowledge Alarm lamp. The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present. All outputs remain off.

The alarm must be cleared by repair or replacement of the defective component. When the sensor returns to within the allowable range, the process will return to the condition when the alarm was activated. The Alarm Acknowledge lamp will extinguish.

PRESSURE SENSOR ERROR

Alarm Condition:

The sensor is out of the allowable range of 0 PSIA to 50.0 PSIA.

Message Display:

CHAMBER PRESSURE OUT OF RANGE

This alarm will turn off all digital outputs except for the alarm and Acknowledge Alarm lamp. The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present. All outputs remain off.

The alarm must be cleared by repair or replacement of the defective component. When the sensor returns to within the allowable range, the process will return to the condition when the alarm was activated. The Alarm Acknowledge lamp will extinguish.

INSITU FILTER TEMPERATURE SENSOR ERROR

Alarm Condition:

The probe is out of the allowable range of -5.0^{o}C to 150^{o}C

Message Display:

INSITU FILTER TEMP OUT OF RANGE

This alarm will turn off all digital outputs except for the alarm and Acknowledge Alarm lamp. The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present. All outputs remain off.

The alarm must be cleared by repair or replacement of the defective component. When the sensor returns to within the allowable range, the process will return to the condition when the alarm was activated. The Alarm Acknowledge lamp will extinguish.

LOAD TEMPERATURE SENSOR ERROR

Alarm Condition:

The probe is out of the allowable range of -5.0^{o}C to 150^{o}C

Message Display:

LOAD TEMP OUT OF RANGE

This alarm will turn off all digital outputs except for the alarm and Acknowledge Alarm lamp. The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present. All outputs remain off.

The alarm must be cleared by repair or replacement of the defective component. When the sensor returns to within the allowable range, the process will return to the condition when the alarm was activated. The Alarm Acknowledge lamp will extinguish.

DOORS NOT CLOSED

Alarm Condition:

The door limit switch input is on.

Message Display:

DOORS NOT CLOSED

This alarm will turn off all digital outputs except for the alarm and Acknowledge Alarm lamp. The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present. All outputs remain off.

The alarm must be cleared by repair or replacement of the defective component. When the repair is complete, the process will return to the condition when the alarm was activated. The Alarm Acknowledge lamp will extinguish.

DOORS NOT SEALED

Alarm Condition:

The door seal pressure switch reads low (off) for more than 2 minutes.

Message Display:

DOORS NOT SEALED

The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present.

Check that required steam pressure is being supplied to the unit. The alarm must be cleared by repair or replacement of the defective component or providing required steam pressure. When the repair is complete, the process will return to the condition when the alarm was activated. The Alarm Acknowledge lamp will extinguish.

DOORS 1 SEAL LEAK

Alarm Condition:

The door 1 seal flow switch reads high for more that 20 seconds.

Message Display:

DOORS 1 SEAL LEAK

The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present.

Check that required steam pressure is being supplied to the unit. The alarm must be cleared by repair or replacement of the defective component or providing required steam pressure. When the repair is complete, the process will return to the condition when the alarm was activated. The Alarm Acknowledge lamp will extinguish.

DOORS 2 SEAL LEAK

Alarm Condition:

The door 2 seal flow switch reads high for more that 20 seconds.

Message Display:

DOORS 2 SEAL LEAK

The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present.

Check that required steam pressure is being supplied to the unit. The alarm must be cleared by repair or replacement of the defective component or providing required steam pressure. When the repair is complete, the process will return to the condition when the alarm was activated. The Alarm Acknowledge lamp will extinguish.

POWER FAILURE

Alarm Condition:

The processor detect there has been a loss of power.

Message Display:

POWER FAILURE

The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will extinguish.

HIGH CHAMBER PRESSURE

Alarm Condition:

The chamber pressure transducer reads greater than 60 PSIA

Message Display:

HIGH CHAMBER PRESSURE

This alarm will turn off all digital outputs except for the alarm and Acknowledge Alarm lamp. The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present. All outputs remain off.

The alarm must be cleared by repair or replacement of the defective component. When the sensor returns to within the allowable range, the process will return to the condition when the alarm was activated. The Alarm Acknowledge lamp will extinguish.

VACUUM SYSTEM TIMEOUT

Alarm Condition:

The chamber pressure did not achieve the necessary vacuum level within 60 minutes.

Message Display:

VACUUM SYSTEM TIMEOUT

The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present.

The alarm must be cleared by repair or replacement of the defective component. When the sensor returns to within the allowable range, the process will return to the condition when the alarm was activated. The Alarm Acknowledge lamp will extinguish.

LOW STERILIZATION TEMPERATURE

Alarm Condition:

The controlling temperature device reads less than one degree C ($1.0^{o}C$) than the set sterilization temperature for more than 10 seconds.

Message Display:

LOW STERILIZATION TEMPERATURE

The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

The sterilization timer is reset to zero (0:00) minutes and the timer will not restart until the temperature is regained.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present.

The alarm will clear when the sensor returns to the set sterilization temperature. The Alarm Acknowledge lamp will extinguish.

HIGH STERILIZATION TEMPERATURE

Alarm Condition:

The controlling temperature device reads more than two degree C ($2.0^{o}C$) than the set sterilization temperature for more than 2 minutes.

Message Display:

HIGH STERILIZATION TEMPERATURE

The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present.

The alarm will clear when the sensor returns to less than two degrees above the set sterilization temperature. The Alarm Acknowledge lamp will extinguish.

HIGH WATER LEVEL IN DRAIN

Alarm Condition:

The drain high water level switch (LS10) is on for more than 30 seconds

Message Display:

HIGH WATER

The fast exhaust valve shall open to clear the water from the drain. When the switch detects no water in the drain, the fast exhaust valve will close.

The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. The Acknowledge Alarm lamp will stop flashing and remain illuminated if the alarm condition is still present.

The alarm will clear when the switch detects no water in the drain. The Alarm Acknowledge lamp will extinguish.

LEAK TEST FAILURE

Alarm Condition:

The chamber pressure rises above the allowable leak amount. The leak amount set point is determined by adding the chamber pressure at the start of the leak test to the allow able leak amount.

Message Display:

LEAK TEST FAILURE

The alarm will sound and the Acknowledge Alarm lamp will flash. It will also activate the alarm screen of the PanelView 900. The alarm shall be printed and the process will automatically advance to the air admission phase to end the cycle.

Operator Acknowledge:

Press the Acknowledge Alarm button to silence the alarm. Determine the cause of the lead and run another lead test cycle.

INPUT/OUTPUT LIST

NAME	DESIGNATION	MEMORY LOCATION
DOOR 1 NOT FULL OPEN	LS1A	I:1/0
DOOR 1 NOT FULL CLOSED	LS1B	I:1/1
DOOR 1 SAFETY SWITCH OK	PS11A	I:1/2
DOOR 1 SEALED	PS1	I:1/3
DOOR 2 NOT FULL OPEN	LS2A	I:1/4
DOOR 2 NOT FULL CLOSED	LS2B	I:1/5
DOOR 2 SAFETY SWITCH OK	PS11B	I:1/6
DOOR 2 SEALED	PS2	I:1/6
CHAMBER PRESSURE SWITCH	PS6	I:1/7
RUPTURE DISK FAILURE	PS4	I:1/8
EMERGENCY STOP	PB4D1	I:1/10
HIGH DRAIN WATER LEVEL	LT1	I:1/11
CONDENSER TEMP HIGH	TS1	I:1/12
VACUUM PUMP TRIPPED	MS3D2	I:1/13
120VAC POWER SUPPLY OK	N/A	I:1/14
OPEN DOOR	PB200	I:2/0
CLOSE DOOR	PS201	I:2/1
OPEN DOOR 2	PB202	I:2/2
CLOSE DOOR 2	PB203	I:2/3
ALARM ACKNOWLEDGE	PB204	I:2/4

Technical data

SLC 500 System Test General Specifications

The table below lists SLC 500 system test specifications.

Description	Specification	Industry Standard
Temperature	Operating: 0° C to +60° C (32° F to 140° F)	Not Applicable
	Storage: –40° C to +85° C (–40° F to 185° F)	Not Applicable
Humidity	5 to 95% without condensation	Not Applicable
Vibration	Operating: 1.0G @ 5 – 2000 Hz	Not Applicable
	Non-operating: 2.5Gs @ 5 – 2000 Hz	Not Applicable
Shock	Operating: (all modules except relay contact) 30.0Gs (3 pulses, 11 ms)	Not Applicable
	Operating: (relay contact modules – OW, IO combo) 10.0Gs (3 pulses, 11 ms)	Not Applicable
	Non-operating: 50.0Gs (3 pulses, 11 ms)	Not Applicable
Free Fall (drop test)	Portable, 2.268 kg (5 lbs) or less @ 0.762 m (30 in.) (six drops)	Not Applicable
	Portable, 2.268 kg (5 lbs) or more @ 0.1016 m (4 in.) (three flat drops)	Not Applicable
Electromagnetic Compatibility	Showering Arc: 1.5 KV	NEMA ICS 2-230/NEMA ICS 3-304
	Surge Withstand Capability: 3 KV	IEEE Std. 472-1974/ANSI C37.90/90A-1974
	Fast Transient Burst (impulse): 2Kv for 1746 power supplies, 1KV for 1746 I/O and communication lines over 10m (32.84 ft), 5 ns rise time	Internal Allen-Bradley standard ①
	Electrostatic Discharge (ESD): 15 Kv, 100 pF/1.5 Kohm model	Internal Allen-Bradley standard ①
	Radiated Electromagnetic Susceptibility: 5w walkie-talkie @ 464.5 MHz and 153.05 MHz	Internal Allen-Bradley standard ①
Safety	Dielectric Withstand: 1500V ac	UL 508, CSA C22.2 No. 142
	Isolation between Communication Circuits: 500V dc	Not Applicable
	Isolation between Backplane and I/Os: 1500V ac	Not Applicable
	Flammability and Electrical Ignition: UL94V-0	Not Applicable
Certification	UL listed/CSA approved Class 1, Groups A, B, C or D, Division 2 CE marked for all applicable directives	Not Applicable

① Internal Allen-Bradley standards are based on Allen-Bradley's extensive experience in industrial controls. It is also based partly on industry and/or military specifications.

Power Supply Specifications

Description	1746-P1	1746-P2	1746-P3	1746-P4
Line Voltage	85-132/170-265V ac 47-63 Hz	85-132/170-265V ac 47-63 Hz	19.2-28.8V dc	85-132/170-265V ac 47-63 Hz
Typical Line Power Requirement①	135 VA	180 VA	90 VA	240 VA
Maximum Inrush Current	20A	20A	20A	45A
Internal Current Capacity	2A at 5V dc 0.46A at 24V dc	5A at 5V dc 0.96A at 24V dc	3.6A at 5V dc 0.87A at 24V dc	10.0A at 5V dc 2.88A at 24V dc③
Fuse Protection②	1746-F1 or equivalent: 250V-3A Fuse Nagasawa ULCS-61ML-3 or BUSSMANN AGC 3	1746-F2 or equivalent: 250V-3A Fuse SANO SOC SD4 or BUSSMANN AGC 3	1746-F3 or equivalent: 125V-5A Fuse Nagasawa ULCS-61ML-5 or BUSSMAN AGC 5	Non-replaceable fuse is soldered in place.
24V dc User Power Current Capacity	200 mA	200 mA	Not Applicable	1A③
24V dc User Power Voltage Range	18-30V dc	18-30V dc	Not Applicable	20.4-27.6V dc
Ambient Operating Temperature Rating	0° C to 60° C (32° F to 140° F) (Current capacity derated 5% above 55° C)			0° C to 60° C (32° F to 140° F) no derating
Storage Temperature	–40° C to 85° C (–40° F to 185° F)			
Humidity Rating	5-95% (non-condensing)			
Wiring	two #14 AWG wires per terminal (maximum)			
Certification (when product or packaging is marked)	UL listed CSA certified CE marked for all applicable directives			
Hazardous Environment Certification	Class I Division 2			

① Refer to appendix F to determine line power requirements for your configuration.

② Power supply fuse is intended to guard against fire hazard due to short circuit conditions and may not protect the supply from damage under overload conditions.

③ The combination of all output power (5 volt backplane, 24 volt backplane, and 24 volt user source) cannot exceed 70 Watts.